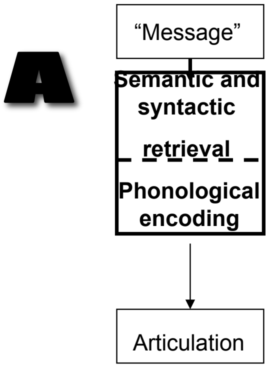
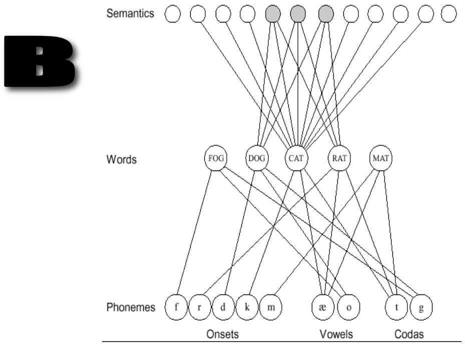


"Message"

Semantic and syntactic retrieval

Phonological encoding

Articulation



Consider the following two models of speech production. Which model(s) would predict (reasonable levels of) each of the following error types:

(1) semantic errors (say "dog" instead of "cat")

(2) non-lexical phonological errors (say "gat" instead of "cat")

(3) lexical phonological errors (say "mat" instead of "cat")

(4) mixed phonological and semantic errors (say "rat" instead of "cat")

Decision Making

Definitions

Decision-making: choosing between alternative courses of action.

Choice among alternatives:

- you have all the information and must choose

Risky choice:

- you know the *likelihood* of various outcomes and must assess potential gain and loss

Choice among alternatives

Choice among alternatives

Example: choosing an apartment

APARTMENT	**Rent**	**Distance**	**Size**	**Clean?**	**Noisy?**
A	$400	10 min	small	N	Y
B	$400	40 min	small	N	N
C	$500	5 min	small	Y	Y
D	$600	20 min	large	Y	N

Choice among alternatives

Compensatory models: positive features can make up for negative features.

Additive

- -- determine “pros” and “cons”
- -- add pros and subtract cons
- -- go with numerically highest

Choice among alternatives

APARTMENT	Rent	Distance	Size	Clean?	Noisy?
A	$400	10 min	small	N	Y
B	$400	40 min	small	N	N
C	$500	5 min	small	Y	Y
D	$600	20 min	large	Y	N

APARTMENT	Rent	Distance	Size	Clean?	Noisy?	Overall
A	+	+	-	-	-	-
B	+	-	-	-	+	-
C	-	+	-	+	-	-
D	-	-	+	+	+	+

Pick the one with most plusses, fewest minuses

Choice among alternatives

Additive model may not give answer that we "want" . . . some features matter more.

Modifications to model:

- weigh dimensions by priority
- (use graded scale)

Choice among alternatives

APARTMENT	**Rent**	**Distance**	**Size**	**Clean?**	**Noisy?**
A	$400	10 min	small	N	Y
B	$400	40 min	small	N	N
C	$500	5 min	small	Y	Y
D	$600	20 min	large	Y	N

Weighted model gives different answer!

APARTMENT	**Rent**	**Distance**	**Size**	**Clean?**	**Noisy?**	**Overall**
A	3	2	0	0	0	5
B	3	0	0	0	1	4
C	0	2	0	1	0	3
D	0	0	1	1	1	3

Warning:
the power of relativity

- Example: vacation packages

(1) PARIS for $2000: 7 days, 6 nights at Hôtel de Crillon; guided tours of Cathédrale de Notre Dame, Tour Eiffel, the Louvre, Arc de Triomphe, and more; free breakfast each morning

(2) ROME for $2000: 7 days, 6 nights at the Albani Hotel; guided tours of the Colosseum, the Pantheon, Villa Borghese, the Vatican, and more; free breakfast each morning

(3) ROME for $2000: 7 days, 6 nights at the Napoleon Hotel; guided tours of the Colosseum, the Pantheon, Villa Borghese, the Vatican, and more

MOST PEOPLE CHOOSE (2) because of “decoy” (3)

Choice among alternatives

Noncompensatory models:

- positive features do NOT make up for negative features or
- don't have time to make "perfect" choice; just need to make a satisfactory one
  - Elimination by aspects
  - Satisficing (Simon, 1957)

Elimination by aspects

- Pick one dimension (e.g., price) and criterion
- Eliminate options that don't meet criterion.
- If still more than one option, pick another dimension and repeat until one choice left.

- Order of choice important for outcome.
- No calculations required: easy to do.

Elimination by aspects

APARTMENT	**Rent**	**Distance**	**Size**	**Clean?**	**Noisy?**
~~**A**~~	~~$400~~	~~10 min~~	~~small~~	~~N~~	~~Y~~
~~**B**~~	~~$400~~	~~40 min~~	~~small~~	~~N~~	~~N~~
C	$500	5 min	small	Y	Y
~~**D**~~	~~$600~~	~~20 min~~	~~large~~	~~Y~~	~~N~~

Assume price, cleanliness, and noise important:
Don’t want to spend more than $500 (drop D)
Want something clean (drop A and B)

Choose C

Elimination by aspects

APARTMENT	**Rent**	**Distance**	**Size**	**Clean?**	**Noisy?**	**Overall**
~~**A**~~	~~$400~~	~~10 min~~	~~small~~	~~N~~	~~Y~~	
B	$400	40 min	small	N	N	
~~**C**~~	~~$500~~	~~5 min~~	~~small~~	~~Y~~	~~Y~~	
~~**D**~~	~~$600~~	~~20 min~~	~~large~~	~~Y~~	~~N~~	

Assume price, cleanliness, and noise important:
Don’t want to spend more than $500 (drop D)
Want something quiet (drop A and C)

Choose B

Satisficing

- Decide on a set of minimum criteria.
- Look through options and choose first one that meets criteria.

- Again, much less effort.
- Good when time is limited.

Satisficing

APARTMENT	**Rent**	**Distance**	**Size**	**Clean?**	**Noisy?**	**Overall**
A	$400	10 min	small	N	Y	
B	$400	40 min	small	N	N	
C	$500	5 min	small	Y	Y	
D	$600	20 min	large	Y	N	

Want to spend less than $600 and be within 10 min.

Choose A.

Satisficing example (Dawes, 1988)

Suppose you want to hire someone and have 100 applicants for the job. Can’t look at them all. Getting any one of the top 5 would be fine. Time-saving strategy:

- evaluate a random 15 and select the best
- look through the others until you find one better than this one
- probability that this person is in the top 5? 83%
- average number of applicants looked at? 44/100

Summary

- Even when all information is available and there is no risk, decision-making is difficult.
  - > hard to compare when alternatives better or worse along different dimensions
- Compensatory models (and modifications)
  - Additive
  - > may not have time/resources to evaluate fully
- Noncompensatory models
  - Elimination by aspects
  - Satisficing

Decision-making under risk

Decision-making under risk

- Making decisions when you don’t know for sure what will happen, but can know how likely things are (e.g., gambling, investments).

Example Choice

- 11% chance of $1,000
- 89% chance of nothing

- 10% chance of $5000
- 90% chance of nothing

A

B

Another Example Choice

- 100% chance of $1,000

- 89% chance of $1000
- 10% chance of $5000
- 1% chance of nothing

A

B

Decision-making under risk

- Making decisions when you don't know for sure what will happen, but can know how likely things are (e.g., gambling, investments).
- Key questions has been whether people decide "normatively" and "rationally".
  - pick choice that will give biggest payoff
  - make consistent decisions

An example

A choice:

- 20% chance of winning $40
- 25% chance of winning $30

- Expected value = (Value of outcome) x (Probability of outcome)
- $40 x .2 = $8
- $30 x .25 = $7.50

Expected value theory

- Sometimes use intuitively in everyday life
- Would you be willing to flip a coin if
  - you get $2 for heads but
  - you lose $3 for tails?

  - most people (!) say “no” -- why?
  - expected value=(1/2 x 2) - (1/2 x 3) = 50 cents loss

Expected value theory

- Another example.
- Would you be willing to roll dice if
  - you get $3 for two or less but
  - you lose $2 for three or more?

  - some people now say “yes” (get more if you win than you give up if you lose)
  - BUT expected value=2(1/6 x 3) - 4(1/6 x 2) = net 1/3 of a dollar loss

Come on!
Who takes EVT seriously?

The Government

- Since Executive Order 12291 all federal agencies must weigh costs against benefits before writing new regulations
- 51 construction workers died when a scaffold collapsed at a power plant. OSHA proposed new safety rules estimated to save 23 lives/year and cost $27.3 million

The Government

"Since OSHA valued a life at $3.5 million, the regulation easily passed the cost-benefit test. But the Office of Management and Budget, the administration's regulatory gatekeeper, stepped in with a new price on a construction worker's life – $1 million, based on its own research – that stalled the rules for years."

San Diego Union Tribune; July 14, 1990

Do (non-government) people follow EVT?

- Gambling
  - expected value always against you
  - but fun
- Insurance
  - negative expected value
  - but guarding against big loss

Expected utility theory

- Utility – subjective, not objective value
- People maximize expected utility rather than expected value
- So, instead of multiplying ACTUAL VALUE by probability, compute UTILITY (perceived value or loss) of each and multiply that

---

Expected utility theory

Choice:

- 100% chance of $1
- 0.000014% chance of $3,000,000
- Expected value of first choice higher
- But *utility* of three million much greater than utility of one dollar
- However, utility of $1 goes up if you are hungry and that is your only dollar!

Value vs. Utility

- Value of $1 vs. $3mil
- Utility of $1 vs. $3mil

vs.

vs.

Expected value vs. utility

A small town in Wales has a village idiot. He was once offered the choice between a pound and a shilling and he took the shilling. People came from everywhere to witness this phenomenon. They repeatedly offered him the choice between a pound and a shilling. He always took the shilling.

But are people rational?

- Allais Paradox
  - propose two choices where people agree on the best decision in each case.
  - then show that these two decisions are inconsistent.

Allais Paradox: Choice One

100% chance of $1,000	89% chance of $1000 10% chance of $5000 1% chance of nothing
A	**B**

Allais Paradox: Choice Two

- 11% chance of $1,000
- 89% chance of nothing

- 10% chance of $5000
- 90% chance of nothing

A

B

Typical choices

100% chance of $1,000

89% chance of $1000
10% chance of $5000
1% chance of nothing

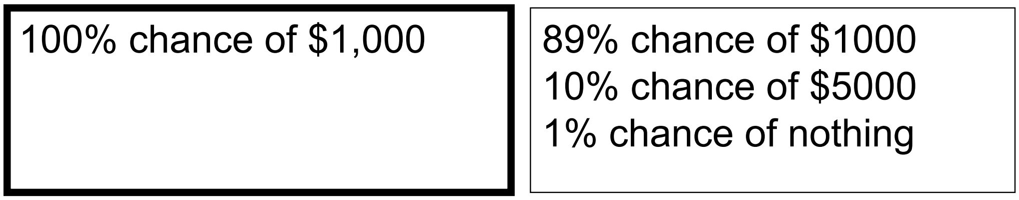
Most people choose A

11% chance of $1,000
89% chance of nothing

10% chance of $5000
90% chance of nothing

Most people choose B

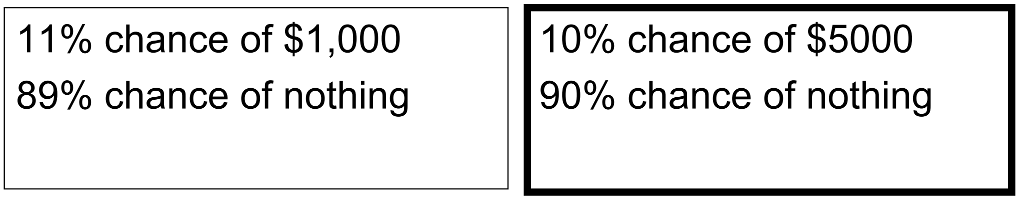
Typical choices



100% chance of $1,000

89% chance of $1000
10% chance of $5000
1% chance of nothing

Expected value higher for B: $890 + $500 = $1390



11% chance of $1,000
89% chance of nothing

10% chance of $5000
90% chance of nothing

Expected value higher for B

Certainty effect

- People do not always follow expected value
- People are not always consistent

Certainty effect: people often choose certain rewards and avoid certain failures, against expected value.

Framing Effects

Framing Effects

- Imagine the US is preparing for an outbreak of disease which is expected to kill 600 people. Two programs are proposed:
- Program A:
  - 200 people will be saved
- Program B:
  - 1/3 chance 600 people saved
  - 2/3 chance nobody will be saved

Framing Effects

- Imagine the US is preparing for an outbreak of disease which is expected to kill 600 people. Two programs are proposed:
- Program C:
  - 400 people will die
- Program D:
  - 1/3 probability no people will die
  - 2/3 probability 600 people will die

Imagine the US is preparing for an outbreak of disease which is expected to kill 600 people. Two programs are proposed:

- Program A:
  - 200 people will be saved
- Program B:
  - 1/3 chance 600 people saved
  - 2/3 chance nobody will be saved

- Program C:
  - 400 people will certainly die
- Program D:
  - 1/3 probability no people will die
  - 2/3 probability 600 people will die

most people pick A & D

But A = C and B = D !!

the framing biases the choice!

Framing Effects

- When problem framed as who will be saved, most people go for certain gain.
- When same problem framed as who will die, most people avoid certain loss.
- Loss-aversion: people's tendency to strongly prefer avoiding losses to acquiring gains. Some studies suggest that losses are twice as powerful, psychologically, as gains.

More framing effects

- Suppose you and your friend are going to the theater. When you get there, you realize that you have lost the tickets, which cost $100. You have more than $100 cash with you and the theater is still selling tickets. Do you buy another set?
  - Most people say no
- Suppose you and your friend are going to the theater. When you get there, you realize that you have lost $100 cash. Your tickets cost $100 and you can still get a full refund. Would you cash in the tickets?
  - Most people say no (opposite choice!)

More framing effects

- Psychic budgets
- In first case, $100 falls in "ticket budget"
  - $200 too much for a ticket
- In second, $100 falls in "bad luck budget"
  - not considered related to ticket price
- But note that outcomes are the same!
  - see play, out $200
  - don't see play, out $100

Sunk Cost Fallacy

- When past actions affect future choices in an irrational manner
- Walk out of a play when you've paid $10/ticket, but not when you've paid $50/ticket
- If you walk out, you will not get your money back, regardless of how much you paid!

Summary

- Framing effects: different decisions to the same problem when it is posed different ways
  - lives saved versus lives lost
  - psychic budgets
  - sunk cost of $10 vs. sunk cost of $50
- Irrational because inconsistent (even though they may be predictable)

Summary

- But can lead to adaptive (helpful) decisions in some circumstances
  - sunk cost ‘fallacy’ adaptive in cases that require modest losses for eventual gains
    - learning a skill
    - long-term investment in the stock market
- Important implications for everyday life
  - medical decisions
  - economic decisions
  - our own abilities to take appropriate risks

Example Question

Jenny takes biology and chemistry courses that have different attendance policies. Her biology professor says that Jenny will lose 5 points from her final grade each time she misses class. Her chemistry professor says that Jenny will gain 5 points for each class she attends, out of a total number of points allocated for attendance as part of the final grade. How is Jenny likely to respond to these two situations and why might there be differences in her response?